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10/707,729	01/07/2004	Peter Hallemeier	OPT-008CP2	1728

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EXAMINER	
BLEVINS, JERRY M	
ART UNIT	**PAPER NUMBER**
2883	

DATE MAILED: 09/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/707,729	HALLEMEIER ET AL.
	Examiner	Art Unit
	Jerry Martin Blevins	2883

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 28 July 2006.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11,17-21,25,28-31,33-35,39 and 44* is/are rejected.

7)☒ Claim(s) *12-16,22-24,26,27,32,36-38 and 40-43* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 28, 2006 has been entered.

Response to Arguments

Applicant's arguments filed July 28, 2006 have been fully considered but they are not persuasive.

Namely, applied prior art reference to Shoval, US 6,360,045, teaches converting to the fundamental mode (column 2, line 66 – column 3, line 15, column 8, lines 49-64 and column 9, line 20 – column 11, line 50). Furthermore, Shoval does not equate this fundamental mode to noise, but rather teaches that the conversion helps eliminate noise, which implies information content (see above columns and lines).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 10, 11, 17, 18, 28, 29, and 39 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent to Shoval et al., number 6,360,045.

Regarding claim 1, Shoval teaches a multi-mode optical fiber link (Figure 13) comprising:

(a) a single-mode optical fiber (element 104) having an input that receives an optical signal for transmission through the multi-mode optical fiber link;

(b) a first spatial mode converter (126) having an input that is coupled to an output of the single-mode optical fiber, the first spatial mode converter converting the optical signal to a plurality of modes including a fundamental mode with information content (column 2, line 66 – column 3, line 15, column 8, lines 49-64 and column 9, line 20 – column 11, line 50) and conditioning a modal profile of the optical signal for propagation through a multi-mode optical fiber (column 9, line 20 – column 10, line 4);

(c) a multi-mode optical fiber (128) having an input that is coupled to an output of the first spatial mode converter, the multi-mode optical fiber propagating the optical signal having the plurality of modes; and

(d) a second spatial mode converter (130) having an input that is coupled to an output of the multi-mode optical fiber, the second spatial mode converter reducing a

number of optical modes in the optical signal, wherein both the first and the second spatial mode converters increase an effective bandwidth of the optical signal propagating through an output of the second spatial mode converter (column 9, line 20 – column 10, line 4).

Regarding claim 10, Shoval teaches the limitations of the base claim 1. Shoval also teaches that an optical detector (114) that is butt-coupled directly to the output of the second spatial mode converter (column 9, line 20 – column 10, line 4).

Regarding claim 11, Shoval teaches the limitations of the base claim 1. Shoval also teaches a second single-mode optical fiber (112) that is coupled directly to the output of the second spatial mode converter.

Regarding claim 17, Shoval teaches the limitations of the base claim 1. Shoval also teaches that the second spatial mode converter reduces a number of higher-order modes propagating through the output of the multi-mode optical fiber link (column 9, line 20 – column 10, line 4).

Regarding claim 18, Shoval teaches the limitations of the base claim 1. Shoval also teaches that the second spatial mode converter reduces a number of lower-order modes propagating through the output of the multi-mode optical fiber link (column 9, line 20 – column 10, line 4).

Regarding claim 28, Shoval teaches a multi-mode optical communication system (Figure 13) comprising:

(a) an optical transmitter (102) that generates an optical signal at an output;

(b) a first spatial mode converter (126) having an input that is coupled to an output of the single-mode optical fiber, the first spatial mode converter converting the optical signal to a plurality of modes including a fundamental mode with information content (column 2, line 66 – column 3, line 15, column 8, lines 49-64 and column 9, line 20 – column 11, line 50) and conditioning a modal profile of the optical signal for propagation through a multi-mode optical fiber (column 9, line 20 – column 10, line 4);

(c) a multi-mode optical fiber (128) having an input that is coupled to an output of the first spatial mode converter at an interface, the interface exciting higher-order modes in the optical signal propagating in the multi-mode optical fiber (column 9, line 20 – column 10, line 4);

(d) a second spatial mode converter (130) having an input that is coupled to an output of the multi-mode optical fiber, the second spatial mode converter reducing a number of optical modes in the optical signal, wherein both the first and the second spatial mode converters increase an effective bandwidth of the optical signal propagating through an output of the second spatial mode converter (column 9, line 20 – column 10, line 4); and

(e) an optical receiver (114) having an input that is coupled to the output of the second spatial mode converter, the optical receiver receiving the optical signal.

Regarding claim 29, Shoval teaches the limitations of the base claim 28. Shoval also teaches that the transmitter generates the optical signal with relatively low time-varying phase and sideband information (column 9, line 20 – column 10, line 4).

Regarding claim 39, Shoval teaches the limitations of the base claim 28. Shoval also teaches the receiver comprises an optical detector that is butt-coupled directly to the output of the second spatial mode converter (column 9, line 20 – column 10, line 4).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shoval in view of US Patent to DeCusatis, number 6,415,076.

Regarding claims 2 and 33, Shoval teaches the limitations of the base claims 1 and 28, respectively. Shoval does not teach that the first spatial mode converter comprises a modal conditioning patch that conditions the optical signal propagating from the single-mode optical fiber to a multi-mode optical signal for transmission through the multi-mode optical fiber. DeCusatis teaches a modal conditioning patch (Figures 1-7). It would have been obvious to one of ordinary skill in the art at the time of the invention to implement the modal conditioning patch of DeCusatis in the first spatial mode converter of Shoval. The motivation would have been to increase transmission distances (DeCusatis, column 1, lines 15-28).

Claims 3-9, 20, 21, 34, 35, and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shoval in view of US Patent to Cunningham et al., number 6,609,834.

Regarding claims 3 and 4, Shoval teaches the limitations of the base claim 1. Shoval also teaches that the input of the multi-mode optical fiber is coupled to the output of the first spatial mode converter at an interface (column 9, line 20 – column 10, line 4). Shoval does not teach that the interface couples a geometric center optical axis of the first spatial mode converter to a geometric center optical axis of the multi-mode optical fiber with a predetermined offset distance, wherein the predetermined offset distance is between about fifteen and twenty-five micrometers. Cunningham teaches an offset launch (Figures 3-7,9,12) with a predetermined offset distance of 18 micrometers (column 7, lines 32-55). It would have been obvious to one of ordinary skill in the art at the time of the invention to include the offset launch of Cunningham in the multi-mode optical fiber link of Shoval. The motivation would have been to reduce back reflection.

Regarding claim 5, Shoval teaches the limitations of the base claim 1. Shoval also teaches that the input of the multi-mode optical fiber is coupled to the output of the first spatial mode converter at an interface (column 9, line 20 – column 10, line 4). Shoval does not teach that the a center of a modal profile of the optical signal is launched from the first spatial mode converter into the multi-mode optical fiber at a position that is displaced a predetermined distance from a geometric center optical axis of the multi-mode optical fiber. Cunningham teaches an offset launch (Figures 3-7,9,12

and column 7, lines 32-55) at a predetermined distance from a geometric center optic axis of the multi-mode fiber. It would have been obvious to one of ordinary skill in the art at the time of the invention to include the offset launch of Cunningham in the multi-mode optical fiber link of Shoval. The motivation would have been to reduce back reflection.

Regarding claim 6, Shoval teaches the limitations of the base claim 1. Shoval also teaches that the input of the multi-mode optical fiber is coupled to the output of the first spatial mode converter at an interface (column 9, line 20 – column 10, line 4). Shoval does not teach that the a center of a modal profile of the optical signal is launched from the first spatial mode converter into the multi-mode optical fiber at a position that is displaced a predetermined distance from a peak optical intensity profile in the multi-mode optical fiber. Cunningham teaches an offset launch (Figures 3-7,9,12 and column 7, lines 32-55) at a predetermined distance from a peak optical intensity profile in the multi-mode fiber. It would have been obvious to one of ordinary skill in the art at the time of the invention to include the offset launch of Cunningham in the multi-mode optical fiber link of Shoval. The motivation would have been to reduce back reflection.

Regarding claim 7, Shoval teaches the limitations of the base claim 1. Shoval also teaches that the input of the multi-mode optical fiber is coupled to the output of the first spatial mode converter at an interface (column 9, line 20 – column 10, line 4). Shoval does not teach a predetermined non-zero angle between a geometric center optical axis of the first spatial mode converter and a geometric center optical axis of the

multi-mode optical fiber. Cunningham teaches a predetermined non-zero angled launch (Figures 4-6,12 and column 7, lines 32-55) relative to a geometric center optical axis of the multi-mode optical fiber. It would have been obvious to one of ordinary skill in the art at the time of the invention to include the angled launch of Cunningham in the multi-mode optical fiber link of Shoval. The motivation would have been to reduce back reflection.

Regarding claim 8, Shoval teaches the limitations of the base claim 1. Shoval also teaches that the input of the multi-mode optical fiber is coupled to the output of the first spatial mode converter at an interface (column 9, line 20 – column 10, line 4). Shoval does not teach that the optical signal is launched from the first spatial mode converter into the multi-mode optical fiber at a predetermined non-zero angle relative to a geometrical center optical axis of the multi-mode optical fiber. Cunningham teaches a predetermined non-zero angled launch (Figures 4-6,12 and column 7, lines 32-55) relative to a geometrical center optical axis of the multi-mode optical fiber. It would have been obvious to one of ordinary skill in the art at the time of the invention to include the angled launch of Cunningham in the multi-mode optical fiber link of Shoval. The motivation would have been to reduce back reflection.

Regarding claim 9, Shoval teaches the limitations of the base claim 1. Shoval also teaches that the input of the multi-mode optical fiber is coupled to the output of the first spatial mode converter at an interface (column 9, line 20 – column 10, line 4). Shoval does not teach that the optical signal is launched from the first spatial mode converter into the multi-mode optical fiber at a predetermined non-zero angle relative to

a peak optical intensity profile in the multi-mode optical fiber. Cunningham teaches a predetermined non-zero angled launch (Figures 4-6,12 and column 7, lines 32-55) relative to a peak optical intensity profile in the multi-mode optical fiber. It would have been obvious to one of ordinary skill in the art at the time of the invention to include the angled launch of Cunningham in the multi-mode optical fiber link of Shoval. The motivation would have been to reduce back reflection.

Regarding claim 20, Shoval teaches a method of increasing an effective modal bandwidth of an optical signal transmitting through a multi-mode optical fiber (column 9, line 20 – column 10, line 4), the method comprising:

(a) spatial mode converting (using special mode converter 126, Figure 13) an optical signal to a plurality of modes including a fundamental mode with information content (column 2, line 66 – column 3, line 15, column 8, lines 49-64 and column 9, line 20 – column 11, line 50), thereby reducing modal dispersion and increasing an effective bandwidth of the optical signal (column 9, line 20 – column 10, line 4);

(b) launching the spatially mode converted optical signal having the plurality of modes into a multi-mode optical fiber (128);

(c) propagating the spatially mode converted optical signal having the plurality of modes through the multi-mode optical fiber (128); and

(d) spatial mode converting (using spatial mode converter 130) the spatially mode converted optical signal propagating through the multi-mode optical, thereby further reducing modal dispersion and further increasing the effective bandwidth of the optical signal (column 9, line 20 – column 10, line 4).

Shoval does not teach that the launching step is at an angle and a displacement relative to a geometrical center optical axis of the multi-mode optical fiber, the angle and the displacement being chosen to excite higher-order modes in the spatially converted optical signal propagating in the multi-mode optical fiber. Cunningham teaches a predetermined non-zero angled launch (Figures 4-6,12 and column 7, lines 32-55) relative to a geometrical center optical axis of the multi-mode optical fiber. Furthermore, Cunningham also teaches an offset launch (Figures 3-7,9,12 and column 7, lines 32-55) at a predetermined distance from a geometric center optic axis of the multi-mode fiber. It would have been obvious to one of ordinary skill in the art at the time of the invention to include the angled and offset launches of Cunningham in the method of Shoval. The motivation would have been to reduce back reflection.

Regarding claim 21, Shoval in view of Cunningham teaches the limitations of the base claim 20. Shoval also teaches a zero-angled, zero offset launch (column 9, line 20 – column 10, line 4).

Regarding claim 34, Shoval teaches the limitations of the base claim 34. Shoval does not teach that the interface couples a geometric center optical axis of the first spatial mode converter to a geometric center optical axis of the multi-mode optical fiber with a predetermined offset distance. Cunningham teaches an offset launch (Figures 3-7,9,12 and column 7, lines 32-55) at a predetermined distance from a geometric center optic axis of the multi-mode fiber. It would have been obvious to one of ordinary skill in the art at the time of the invention to include the offset launch of Cunningham in the

multi-mode optical fiber link of Shoval. The motivation would have been to reduce back reflection.

Regarding claim 35, Shoval teaches the limitations of the base claim 34. Shoval does not teach that the interface couples a geometric center optical axis of the first spatial mode converter to a geometric center optical axis of the multi-mode optical fiber with a predetermined angle. Cunningham teaches a predetermined angled launch (Figures 4-6,12 and column 7, lines 32-55) relative to a geometrical center optical axis of the multi-mode optical fiber. It would have been obvious to one of ordinary skill in the art at the time of the invention to include the offset launch of Cunningham in the multi-mode optical fiber link of Shoval. The motivation would have been to reduce back reflection.

Regarding claim 44, Shoval teaches a multi-mode optical communication system (Figure 13), comprising:

(a) a means for spatial mode converting (using special mode converter 126, Figure 13) an optical signal to a plurality of modes including a fundamental mode with information content (column 2, line 66 – column 3, line 15, column 8, lines 49-64 and column 9, line 20 – column 11, line 50), thereby reducing modal dispersion and increasing an effective bandwidth of the optical signal to a plurality of modes (column 9, line 20 – column 10, line 4);

(b) a means for launching the spatially mode converted optical signal having the plurality of modes into a multi-mode optical fiber (128);

(c) a means for propagating the spatially mode converted optical signal having the plurality of modes through the multi-mode optical fiber (128); and

(d) a means for spatial mode converting (using spatial mode converter 130) the spatially mode converted optical signal propagating through the multi-mode optical, thereby further reducing modal dispersion and further increasing the effective bandwidth of the optical signal (column 9, line 20 – column 10, line 4).

Shoval does not teach that the launching means is at an angle and a displacement relative to a geometrical center optical axis of the multi-mode optical fiber, the angle and the displacement being chosen to excite higher-order modes in the spatially converted optical signal propagating in the multi-mode optical fiber. Cunningham teaches a predetermined non-zero angled launch (Figures 4-6,12 and column 7, lines 32-55) relative to a geometrical center optical axis of the multi-mode optical fiber. Furthermore, Cunningham also teaches an offset launch (Figures 3-7,9,12 and column 7, lines 32-55) at a predetermined distance from a geometric center optic axis of the multi-mode fiber. It would have been obvious to one of ordinary skill in the art at the time of the invention to include the angled and offset launches of Cunningham in the system of Shoval. The motivation would have been to reduce back reflection.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shoval in view of US Pre Grant Publication to Danziger et al., number 2002/0118934.

Regarding claim 19, Shoval teaches the limitations of the base claim 1. Shoval does not teach that at least one of the first and the second spatial mode converters comprises an optical filter. Danziger teaches an optical fiber link (Figure 4) comprising

a first and a second spatial mode converter (160), wherein the first spatial mode converter comprises an optical filter (50). It would have been obvious to one of ordinary skill in the art at the time of the invention to include the filter of Danziger in the mode converter of Shoval. The motivation would have been to reduce noise in the optical signal.

Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shoval in view of Cunningham, further in view of US Pre Grant Publication to Phua et al., number 2003/0118263.

Regarding claim 25, Shoval in view of Cunningham teaches the limitations of the base claim 20. Shoval in view of Cunningham does not teach that the spatially mode converted optical signal reduces changes in the effective modal bandwidth of the optical signal that are caused by polarization effects in the multi-mode optical fiber. Phua teaches a spatially mode converted optical signal which reduces changes in the effective modal bandwidth of the optical signal that are caused by polarization effects in a multi-mode optical fiber (page 3, paragraphs 32-35). It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Phua in the method of Shoval in view of Cunningham. The motivation would have been reduce dispersion due to polarization.

Claims 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shoval in view of US Pre Grant Publication to Forrest et al., number 2002/0097941.

Regarding claims 30 and 31, Shoval teaches the limitations of the base claim 28. Shoval does not teach that the transmitter comprises an electro-absorption modulated laser comprising a semi-conductor active layer that is chosen for operation without external cooling. Forrest teaches a transmitter comprising an electro-absorption modulated laser (page 7, paragraph 71) comprising a semi-conductor active layer (paragraph 10, pages 1 and 2) that is chosen for operation without external cooling. It would have been obvious to one of ordinary skill in the art at the time of the invention to include the electro-absorption modulated laser of Forrest in the transmitter of Shoval. The motivation would have been to increase the transmitter sensitivity (Forrest, page 7, paragraph 71).

Allowable Subject Matter

Claims 12-16, 22-24, 26, 27, 32, 36-38, and 40-43 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 12, Shoval teaches the limitations of the base claim 1. However, Shoval does not teach a single-mode optical fiber that couples two segments of the multi-mode optical fiber. Moreover, Shoval, either alone or in combination with

the other prior art, does not disclose or render obvious a single-mode optical fiber that couples two segments of the multi-mode optical fiber.

Regarding claims 13 and 36, Shoval teaches the limitations of the base claims 1 and 28, respectively. However, Shoval does not teach that at least one of the first and the second spatial mode converters comprises a slit aperture. Moreover, Shoval, either alone or in combination with the other prior art, does not disclose or render obvious a spatial mode converter comprising a slit aperture.

Regarding claims 14 and 37, Shoval teaches the limitations of the base claims 1 and 28, respectively. However, Shoval does not teach that at least one of the first and the second spatial mode converters comprises a pin hole aperture. Moreover, Shoval, either alone or in combination with the other prior art, does not disclose or render obvious a spatial mode converter comprising a pin hole aperture.

Claims 15 and 16 depend from claim 14.

Claim 38 depends from claim 37.

Regarding claim 22, Shoval in view of Cunningham teaches the limitations of the base claim 20. However, neither Shoval nor Cunningham teach the step of aperturing the spatially mode converted optical signal. Moreover, Shoval in view of Cunningham, either alone or in combination with the other prior art, does not disclose or render obvious the step of aperturing the spatially mode converted optical signal.

Regarding claim 23, Shoval in view of Cunningham teaches the limitations of the base claim 20. However, neither Shoval nor Cunningham teach the step of blocking the spatially mode converted optical signal. Moreover, Shoval in view of Cunningham,

either alone or in combination with the other prior art, does not disclose or render obvious the step of blocking the spatially mode converted optical signal.

Regarding claim 24, Shoval in view of Cunningham teaches the limitations of the base claim 20. However, neither Shoval nor Cunningham teach that the spatially mode converted optical signal reduces changes in the effective modal bandwidth of the optical signal that are caused by thermal variations in the multi-mode optical fiber. Moreover, Shoval in view of Cunningham, either alone or in combination with the other prior art, does not disclose or render obvious that the spatially mode converted optical signal reduces changes in the effective modal bandwidth of the optical signal that are caused by thermal variations in the multi-mode optical fiber.

Regarding claim 26, Shoval in view of Cunningham teaches the limitations of the base claim 20. However, neither Shoval nor Cunningham teach that the spatially mode converted optical signal reduces changes in the effective modal bandwidth of the optical signal that are caused by mechanical stress in the multi-mode optical fiber. Moreover, Shoval in view of Cunningham, either alone or in combination with the other prior art, does not disclose or render obvious that the spatially mode converted optical signal reduces changes in the effective modal bandwidth of the optical signal that are caused by mechanical stress in the multi-mode optical fiber.

Regarding claim 27, Shoval in view of Cunningham teaches the limitations of the base claim 20. However, neither Shoval nor Cunningham teach that the spatially mode converted optical signal reduces changes in the effective modal bandwidth of the optical signal that are caused by optical fiber splices in the multi-mode optical fiber. Moreover,

Shoval in view of Cunningham, either alone or in combination with the other prior art, does not disclose or render obvious that the spatially mode converted optical signal reduces changes in the effective modal bandwidth of the optical signal that are caused by optical fiber splices in the multi-mode optical fiber.

Regarding claim 32, Shoval in view of Forrest teaches the limitations of the base claim 30. However, neither Shoval nor Forrest teaches a semiconductor active layer that is chosen so that it is transparent to light propagating through the semiconductor layer when a zero or a reverse bias voltage is applied across the semiconductor layer at operating temperatures of the electro-absorption modulator that are substantially greater than 25 degrees Celsius. Moreover, Shoval in view of Forrest, either alone or in combination with the other prior art, does not disclose or render obvious the above further limitations.

Regarding claim 40, Shoval teaches the limitations of the base claim 28. However, Shoval does not teach that the optical receiver comprises an active filter that reconstructs dispersed optical signals received by the receiver. Moreover, Shoval, either alone or in combination with the other prior art of record, does not disclose or render obvious a receiver comprising an active filter that reconstructs dispersed optical signals.

Claims 41-43 depend from claim 40.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jerry Martin Blevins whose telephone number is 571-272-8581. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on 571-272-2415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JMB

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